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Choosing an Orchard

by

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written specially for use in the



Pacific



Horticultural Correspondence



School



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Suggestions for Study.

Read carefully each chapter or paragraph to find points treated—then return and carefully study several times the important points to fix them in your memory, with the object of taking the examinations later.

Marking passages of special interest to you will enable you to refer to them easily and helps to fix them in your memory.

The italics in this article are by the principal and are intended to call special attention to these passages, which should be carefully studied as an aid in examinations and to fix these points in the memory.

Choosing an Orchard.

By C. I. Lewis, Horticulturist, Oregon Agricultural College.

How to choose an orchard is one of the most perplexing problems we have in horticulture and the traveller who comes to our Northwest country seeking an investment in fruit land easily becomes bewildered. He travels from one region to another only to be told in each locality that they have the best and often the only fruit district to be found. He is told many stories concerning soils, climate, etc., and is often impressed strongly with the statement that unless he will close up on a certain deal within a few hours he is losing an investment which cannot be duplicated.

The average man in buying an orchard is apt to make several very serious mistakes, the first of which is that he often buys too soon. I have known of people coming into a certain section at noon and by nightfall having bought up a tract of land. This is a very foolish procedure. There is lots of very good fruit land in the states of Washington, Oregon and Idaho, and of course there is lots of poor land, but these states are so large that one can get a good investment any day in the year, and the wise man will go at the matter leisurely. He will take time to look at all phases of the question and under no circumstances will he buy land he has not seen. The possible exception to this might be that some friend in whom he has explicit confidence is vouching for the piece of land in question.

A soil analysis often leads a man astray. He feels that if an analysis can be procured and it shows a certain amount of plant food he is assured it is a good piece of land, and a little later he will find this may mean much or very little.

Before planting an orchard there are two points we should clearly understand: First, we should take steps to find out what the piece of land we have in mind is peculiarly adapted to; or, secondly, we should hunt a location which is especially adapted to the crop we have in mind. Often we find pears planted where apples should be grown, cherries are planted on apple land, peaches planted on prune land, etc. The real test of any orchard location is the crop, and a *piece of land is only worth what it will produce*. Un-

less it will produce a mature tree and one which is productive the land will be worth very little as far as fruit growing is concerned. Many people are mislead by the appearance of young trees. I have seen some splendid looking orchards on very thin soil. Often they will grow fairly well on soil with poor drainage, but in order to produce a good, mature, heavy bearing tree, you should have proper conditions—above all this will mean that you must have deep soil.

NATURAL FRUIT AREAS.

In travelling over the world we find that nature has adapted certain regions for certain crops. As we ride in the train across the Mississippi Valley and see the alfalfa fields, the corn fields, the fine herds of cattle and the droves of hogs, we can see that nature has produced conditions which are favorable to such agriculture. In travelling through the South we find the cotton, when we get into Florida we find the pineapple and the citrus fruits, in the vicinity of the great lakes and northern New York and the Niagara peninsula of Canada we find a large fruit belt where tremendous areas of peaches, apples, grapes, etc., are succeeding. If we cross the ocean and go to the Mediterranean we find in Italy, Greece and Spain conditions which fit them for producing fruit. And so all around the world we find that it is ever true that a certain crop is developed either because nature has met the special requirements of these crops or else that the people have been very persevering. The state of Maine, for example, has built up an enviable reputation for sweet corn and its canned product is bringing the highest price. No one would pick out Maine as a natural corn state and in order to grow corn there, intensive and careful methods must be followed, but the people have been spurred on to their best endeavors and as a result the state has built up its reputation as a corn producing state. On our own Pacific Coast the traveller will easily determine that southern California is peculiarly adapted for the production of citrus fruit, and coming into our Northwest we find the great Columbia basin, including the Columbia river, with its tributaries, like the Snake and the Willamette, where nature has been very kind and produced climatic and soil conditions that are unusually favorable to the production of deciduous fruit. Added to this region we would have to include other valleys like the Umpqua, Rogue River and others which might be mentioned. The fruits grown in this region are of the highest color and superb quality, of

unmatched size and attractive form. In addition to this, these regions seem to have the advantage on the whole of producing trees which come into bearing early and bear heavily and regularly. These are the conditions which *mean profitable horticulture* and *larger returns* can be obtained from horticulture than from any other phase of agriculture, provided the conditions are right. Where the climatic and soil conditions are not right for horticulture it will be much better judgment to go into other lines of agriculture. There are, however, few varieties of deciduous fruit which cannot be grown to the highest degree of perfection in the Pacific Northwest. One easily realizes this when they stop to investigate our natural conditions. With elevations ranging from sea-level to the snow line and rainfall from 100 inches to 4 or 5 inches, with soils ranging from the heaviest adobe to the lightest volcanic ash and pumice stone, one easily sees we have the extreme of conditions, which means that in almost every fruit region we can find the requirements fulfilled that certain varieties demand.

What are the points for us to consider in choosing an orchard? I would say that they are a combination of the following: *Climate, altitude, exposure, soil, transportation facilities, area devoted to the fruit industry* or the amount of land which can be devoted to such industry and the *class of people engaged* in horticultural pursuits.

CLIMATE.

If there is one factor which is of *more importance* than another in choosing an orchard it is *climate*. This will surprise some people as they are apt to believe that soil is the only factor, yet if this is true we would find many fruits grown commercially where they are not. There are some varieties of fruit which seem to have a very wide range as they are not so exacting in their requirements as other varieties. The Rome Beauty apple, the Bartlett pear, the Concord grape may be mentioned as typical varieties which have a wide range of adaptability. On the other hand there are varieties which are very narrow in their adaptability and are easily changed from a winter to a summer variety, or from a summer to a late fall or even to an early winter variety by certain climatic conditions.

In noting the adaptability of fruits in our Pacific Northwest we are finding rapidly that our varieties are succeeding best where the climatic conditions seem to come nearer fulfilling the conditions in which the variety originated, or at least is grown to a high degree

of perfection in Eastern localities. If you will but take the pains to study the catalog of fruits of the American Pomological Society and note their recommendations for certain regions of the United States and then in addition will look carefully into the climatic conditions surrounding the production of certain varieties, you will see the close connection which exists in such cases. The Massachusetts Agricultural College Experiment Station has been doing some special investigation concerning the adaptability of varieties to places in Massachusetts and have found that the mean temperature in summer, for example, has a lot to do with the varieties that succeed, and if only a certain degree of warmth is produced certain varieties will not succeed and grow well. We find on our own Pacific coast that the Winesap, which does so well in Wenatchee, or the Jonathan, which does so well in most of the "Inland Empire," are splendid examples as far as climatic conditions are concerned. The Spitzemberg apple originated along the Hudson River—it does not do well in western New York but in regions having conditions resembling those found in the Hudson River valley it does better. When we get this apple in the Hood River, Rogue River and other parts of Oregon it grows to high perfection, but in certain regions of the "Inland Empire" where the mean temperature will run higher, we find the Spitzemberg matures much earlier and is probably at its best at Thanksgiving instead of by Christmas or January. In the region west of the Cascades and in the valleys of the Cascade Range the Gravenstein becomes a fall apple, but when it is grown at an elevation of 3000 to 4000 feet in the "Inland Empire" it becomes a winter apple. The Northern Spy and Baldwin apple seem to do especially well in such regions as western New York but in many regions they mature too early. In many parts of the northwest they become a fall apple, are apt to be mealy and of poor quality. This is especially true when they are grown at low elevations, but on higher elevations they are much better keepers and more juicy, and so we can cite many cases showing the great importance of climatic conditions to variety adaptability. So it can be seen that if one has in mind the growing of certain varieties of fruit he must look carefully into climatic conditions. Our northwest is so large that it will be some time before we will know definitely the best varieties to grow in all cases. Undoubtedly many regions have made a mistake in trying to decide too soon the variety of fruit their region is best adapted to, and while we do not

want to go back and make the mistake of having every orchard a pomological collection, I believe that the northwest as a whole should grow more varieties of fruit than they are growing at the present time commercially.

In considering climate we should divide it under several heads. First, on temperature I have already related the importance of mean and at times extreme temperature of summer and fall in bringing on the maturity of certain varieties. In connection with the temperature we have to consider the length of the growing season. Some regions have a long growing season and these regions produce fall and winter apples to perfection. Other regions have a short growing season and are adapted to summer, fall and possibly early winter varieties. In considering the question of temperature we must also take notice of the winter temperatures. Fortunately, the greater part of our northwest country is not subject to extreme winter conditions. Occasionally we have winter injury which is caused by dry air and soil conditions. Some varieties will not withstand the lowest winter temperatures and will have to be eradicated on that account.

RAINFALL AND MOISTURE.

Under climate we must also consider rainfall and moisture determinant and this is undoubtedly one of the most important factors determining whether we can grow certain varieties to a high degree of perfection and is of great importance on the Pacific coast where we have a wet and dry season. The climatic conditions must be such, coupled with the soil conditions, that enough moisture can be retained to maintain the fruit to maturity or if sufficient rainfall is not present that irrigation is feasible. I very much doubt the advisability of growing apples where the rainfall is 15 inches or less and irrigation is impossible. Prunes, cherries and peaches do not require as much moisture as the apple. Winter apples and pears require more moisture than summer or fall varieties. If an apple, for example, suffers from lack of moisture, it is dull in color, apt to be flat in shape and to have a large percentage of drop. On the other hand if an abundance of moisture is present the apple is a bright color, more elongated, grows to a larger size and is less liable to drop. Thus we see how very important it is to have sufficient moisture.

The greater part of the rainfall in our own northwest occurs

during the winter months and consequently the summer months which comprise the principal growing season are apt to have very little rain. Nearly all sections of the northwest have a dry atmosphere in summer. Often in referring to the region west of the Cascades people are led to believe it is a region of perpetual showers and humidity, whereas during the summer or growing season rains are very rare. The absence of rains during the growing seasons are in some cases a blessing as it gives a drier atmosphere with an abundance of sunshine, which help to produce splendid fruit with the highest color. Rain in June or September at times is considered a drawback to prune and cherry production. This will be treated in more detail a little later.

FROST.

Frost must be considered as coming under climatic conditions and while the northwest as a whole is free from frost, we do have places in practically every valley which is susceptible to frost, and while it is possible in many cases to protect orchards by heating and smudging it is probably better on the whole to choose a site which does not need such treatment, and while it is true that deciduous fruits are apt to develop better in regions more or less susceptible to frost, one must not be misled by this statement. It does not mean you should choose land subject to frost, but get it as free from frost as possible. The gently rolling lands are best. Frosts are often very damaging at the immediate foot of high hills or mountains or in draws or pockets where the cold air can settle. Some canons are free from frost while others catch the cold air and it becomes almost impossible to grow fruit successfully. It is also possible to get at such high altitudes that frost is possible any month of the year. In such cases no matter how good the soil and other conditions may be it would be absolutely useless to attempt to grow many varieties of fruit. On some higher altitudes where canons are present breezes occur in the night-time, this is especially true in Utah, parts of eastern Oregon and even some parts of western Oregon, where the changes of air will produce such rapid circulation that an orchard has splendid protection against frost. I know of one fruit orchard in the state which has had twelve crops without a failure, and a very short distance away is another which very seldom gets a crop. The soil conditions of the two orchards are practically identical, the only difference being that the first or-

chard mentioned is so situated in relation to the canon that it gets a full air circulation which does not reach the second orchard.

WINDS

Prevailing winds are often important factors in fruit production. In many regions west of the Cascade Mts. ocean winds prevail in the afternoon, which means cool nights and a long, slow growing season which is peculiarly adapted for producing perfect fruit. On the other hand winds may become so strong that they interfere with the production of fruit.

Several classes of wind are important: Those directly from the ocean which we find along our coast and which interfere with the pollination of the blossoms and there are the hot, dry winds of the "Inland Empire" which carry with them particles of soil and make it very hard at times to grow certain types of fruit successfully. There is often a relation between prevailing winds and summer and winter temperatures and freedom from frost. Where extreme cold weather occurs in conjunction with high winds it is not uncommon to note that trees are injured on the windward side, whereas trees which are protected from these same winds come through the winter very nicely. Prevailing winds may also be so strong as to cause dropping of the fruit. However, wind is not very important with us in the northwest as a whole, but in certain limited areas it is an important factor and worth looking into.

ALTITUDE

There is a very close relation between altitude and climate. As we go higher we find the condition one gets by going farther north and we soon reach a point in the vicinity of the snow-line where it would be so frosty and winter conditions so severe that it would be impossible to grow fruit successfully. In the higher altitudes the growing season is shorter and varieties must be chosen which will mature in a shorter season. I have known, however, of varieties maturing somewhat earlier on the higher altitudes than on the corresponding lower ones. But this was where the higher soil was very light, whereas the soil of the lower altitude was of a heavy adobe. Where other natural conditions are equal the growing season in the higher altitudes is shorter. It might, however, have a tendency to produce a certain variety better than a given lower altitude. Referring to our Spitzemberg case again, if the soil at the lower altitude had been heavy the Spitzemberg would probably have ma-

tured a little later thus being thrown more into its correct season. The altitude will probably have an influence on prune and cherry production. There is a possibility that one can secure the right altitude relations so that Royal Ann can be grown with very little cracking. If they are of a certain maturity and a heavy rain occurs cracking takes place and the loss is heavy. If the rain comes in the fall when the fruit is mature there is apt to be a heavy loss in prunes. The Experiment Station at present is investigating prune and cherry adaptability with regard to altitude and climatic conditions.

EXPOSURE.

In many parts of the country this seems to become an important factor and many older writers especially, have gone into it in great detail. For the greater part we find that exposure does not mean very much in the northwest. There are a few exceptions, however; for example, west of the Cascade Mts. the hill lands with a southerly exposure are apt to be thin, the prevailing winds and storms for centuries probably having a bearing on this. One finds on these exposures that the natural vegetation is poor and will only produce a few months pasture and is rarely adapted to fruits. Some may grow cherries and prunes and possibly grapes, and in a very few cases apples and pears would succeed. We find the southern is a warm exposure required by grapes to mature well in the fall. If the grape is to develop the highest amount of sugar it must have as much warmth as possible during the ripening period.

We find these same hills which I have mentioned, thin on the southern exposure, running deep on the northern and eastern exposures. In certain instances we find easterly exposures a drawback, this is especially true in hilly sections where frosts occur and the early morning sun strikes the trees before the frost has thawed. Under such conditions the damage is great. During 1911-12 we found some splendid examples of this condition. Where the orchards had been shaded by trees or hills the damage had been practically little or nothing. The southern exposure is used for early maturity. Occasionally it has its drawbacks however. If the soil is light and warm and especially if it is plowed early so that the trees can start into activity, such exposure may mean the trees will get sunscald, especially is this true when we have a warm March or April, followed by a cold month, or where it is warm in the middle of the day and the nights are cold. Cherries are apt to suffer from gum-

osis and apples and pears from sunscald or other such injuries. It would be better in such cases to plant varieties of fruit which naturally come into bloom and activity a little later.

INFLUENCE OF LARGE BODIES OF WATER.

Large bodies of water have an influence on the climate, tending to make more equitable conditions. We do not find as much frost or quite so many extremes of winter conditions in their vicinity. The great fruit region adjacent to our great lakes nicely illustrates this. Here in Oregon the Columbia River and its tributaries undoubtedly has an influence and in central Oregon Goose and Summer Lakes having such an influence that it has made fruit growing successful there, where otherwise it might be a failure.

NATURAL VEGETATION.

The question is often asked of what indication the natural vegetation on a piece of land is, as regards its adaptability to fruit growing. The vegetation in many cases is of great significance and in others little or nothing. For example, our lands heavily timbered with fir are apt to be deep, rich soils, adapted for fruit growing. One of the best indications of good fruit soil is the presence of large, mature trees which produce heavy crops of good fruit. You must realize, however, that in some cases the land is very "spotted" and land in close proximity to such orchards may be very poor. An examination with an auger would show the character of the land on which the orchards occur and thus one can easily compare adjoining conditions to those under which the orchards flourish. The absence of vigorous vegetation or the presence merely of certain grasses or small scrub oak, such as are found on southern hill exposures, are generally indications of poor fruit soil. The oak tree taken as a whole means little or nothing. I have seen them grow on very poor fruit land and at other times on very good fruit land, so oak growth means probably very little to us. East of the Cascade Mts. where the sage brush is strong and luxuriant it is generally safe to conclude that the land is good, as "Better the sage-brush, better the land," is a common saying of people living in such regions.

SOILS.

Before examining the soil you should procure a soil auger, a common carpenter's or ship's auger can be used. One-half inch is

enough, in fact if a larger one is used it will be harder to handle and more than one man will be needed. Have a plumber make some sections of gas pipe, short enough to be carried in a suitcase, when disjointed, and have one of the sections made into a T, so that a short bar can be run through with which to turn the auger. Have the auger welded to one of the short sections. In using the auger make a boring of a few inches and clean it, and keep doing this until you have a boring as deep as necessary. After a little practice with it one will pick up an enormous amount of knowledge concerning the general characteristics of good and poor soil. There are several points to be kept in mind:—These are *drainage, depth, fertility and general character.*

DRAINAGE.

Under drainage we must consider both the surface and the sub-soil drainage. Our climatic conditions are such in many parts of the Pacific coast that one will often find land which is heavily water-logged in winter but which is still good fruit land. We do not want to have land with too much water in the growing season when the trees are active. The surface drainage can generally be determined with very little trouble. But the sub-surface drainage is a much harder point to get at. Many of our lands are sub-irrigated and streams of water can be found travelling in the sub-soils. In many cases they are of great value and give the soil a continuous source of water supply, which means good growth to the trees, but often these sub-surface waters are too abundant. They often follow a strata of rock or clay and are so cold that roots will not succeed in them. While at times trees grow eight or nine years on such soils, they later show a reaction in the form of winter injury and kindred troubles. About the only way to determine these sub-surface streams is with auger borings. At times it is very easy to remove these waters as they travel along certain strata, and by proper tile drainage they can be taken care of, but on the other hand they are often so abundant that the problem of drainage becomes so great that it would be unwise to plant fruit on them, and crops which will adapt themselves to the conditions should be used in place of fruit. Certain land, especially pear lands, are worth drainage, but most trees, like cherry, peach and prune, should not be put on such lands, and only on a limited amount of apple land does it pay to drain.

In considering the subject of drainage we must also consider

seepage water from canals, irrigation ditches, rivers, etc. In many of our irrigated districts the canals are so constructed and the soil is of such a character that seepage is often abundant and such waters are often impregnated with alkali, and sooner or later fruit growing will have to be abandoned. Seepage waters often travel a long way under ground and then crop up, often producing large bodies of water. All things being equal, it is better to choose land at the high line ditch as the man at the lower level may get seepage waters from all the growers above him and sooner or later will have to put in an expensive drainage system. Drainage and irrigation go hand in hand. While irrigation is very valuable, unless drainage is put in the irrigation may prove to be a boomerang and the region may have to be abandoned on account of seepage water.

DEPTH OF SOIL.

The depth of soil is a very important factor. The question is often asked ‘‘How deep should the soil be?’’ It is hard to answer and is naturally relative to other conditions. Where irrigation is not practicable and winter fruit is grown it is important to have deep soil. In regions *without irrigation* it should be at least four feet before unfavorable subsoils are encountered. For walnut land soil that is very deep should be secured. It is only by making frequent soundings with an auger that the depth can be determined.

FERTILITY.

Fertility of the soil is one factor which most people are apt to put their entire stress on, and while it is essential that soil should be fertile to be productive, on the other hand we find most of our soils in the northwest are fairly productive. Many of the soils east of the Cascades are low in nitrogen, while those west of the Range often do not contain as much of this element as is desirable, yet, fortunately, we can easily supply nitrogen with leguminous crops, and there is practically no fruit region which cannot grow some leguminous crop successfully. We often see the influence of rich fertile soils when we note how productive the Bear Creek soil of the Rogue River is, and that of the Willamette River bottoms with its sandy soils.

CHARACTER OF THE SOIL.

Soils vary considerably in their physical character. We have such as the *deep clay loams, free soils, silt and sand loams, gravel, volcanic ash, pumice stone, etc.* These are often spoken of as types,

but as far as adaptability is concerned, the word type means very little. Often the term "red hill land" is used, although we find many gradations of red hill soil, the red characteristic simply meaning that iron was present in the soil and has become oxidized. In speaking of the general characteristics of soil we will speak first of surface soil.

In many of our valleys we find adobe or sticky soils. These often produce pears to very good advantage but are very hard soils to handle. They have to be plowed and harrowed at just the right time or it is almost impossible to get them into good shape. It is hard to get them to take hold of water and hold it for a long time, and if the water is a little too cold disastrous results may be expected. In western Oregon we find the clay loams used for apples and pears. They are retentive of their food and moisture and where they have good depth are generally considered as on the whole good fruit soils. Of course where this soil contains so much clay that it borders on what is known as "white land," it would not be wise to secure it for fruit. They are lands with very poor drainage and if one bears in mind the drainage requirements he will not make the mistake of choosing such lands. Occasionally they are very good for certain classes of fruit if properly drained, but in most cases the drainage problem becomes big and it means cooperation rather than the drainage of the single piece of land. Occasionally the strong clay loams are not adapted for certain varieties of apples. They may keep the trees growing too late or cause the trees to run to vegetative growth too much. I will speak of this under special soils for apples. Free soils are found abundantly and contain silt, sand and clay, are handled easily and are often very productive. These soils are especially adapted for prunes, cherries and similar crops. The silt and sand loams are found west of the Cascades along the fertile river bottoms and where the silt and sand is uniform they are among the most productive west of the Cascade Range. They are especially adapted for apples requiring high color like the Spitzenberg and are warm lands for grapes, peaches and red raspberries, in fact, they have the widest adaptability of any soil west of the Cascades. These soils will produce an enormous range of fruit. I have seen apples, pears, walnuts, peaches, grapes, cherries and nearly all forms of truck and similar products succeeding on such lands. Many can be irrigated and represent the ideal type for small holdings. Unfortunately, many of them have no

good building sites as they are subject to overflow but these rarely do much damage and often deposit layers of silt which are fertile and tend to keep the soil rich. The water does not stay on long and although I have seen it go over the tops of peach trees, these same trees were loaded with fruit the following summer. The old settlers of Oregon passed these up as does the easterner, having in mind the overflows of the Ohio and the Mississippi, and consequently these lands are often neglected. Occasionally they have a good deal of gravel wash and when it comes to the surface, of course they are undesirable for fruit.

East of the Cascades we find that the soils run lighter, consisting of sand, silt or volcanic ash. They are generally soils light in character, can be easily tilled, hold moisture well and are generally rich in mineral plant food. They are soils of very wide adaptability, especially with irrigation, as with the presence of irrigation one can control the moisture content very nicely. It is a very common sight on these soils to see a variety of crops growing, such as grapes, cherries, peaches, apricots, apples and pears, and all seeming to do fairly well. Of course they will not all be produced to the highest degree of perfection since the irrigation of the apple might be entirely different from that which the peach needs. Peaches should not be irrigated up to about three weeks before they are picked. On the other hand if this rule were followed closely it might prove a hardship on the pears or apples. Some of these light soils, particularly the volcanic ash and pumice soils and often the silt loams, are at times subject to blowing. Precautions should be taken in clearing land of such a nature to clear it in such a way that the winds cannot move it before the organic matter has been incorporated into the soil.

Closely associated with the volcanic ash are the pumice soils. These are exceedingly fine soils of volcanic origin and retentive of moisture. In order to grow fruit they must be irrigated and at times it is difficult to irrigate, but under proper management they give very good results.

Oregon as a rule does not have a great deal of stony soil, this is true at least as applied to most of our valleys. Soils which contain considerable floating rock or stones, with a southern exposure, are often adapted for grape culture, and where it is found in our valleys it is very early. In parts of the Walla Walla Valley we find such stony soils. They become warm early in the spring and tend

to hold the heat and are valued because of their early production of small fruit, certain truck crops, etc.

In parts of the "Inland Empire" the mesa soils which are so typical of parts of Utah and Colorado are found. Before planting such soils to fruit some determination should be made regarding their depth. They are often underlaid with marl, shale or gypsum and it is the general belief of growers that such soils are not well adapted to fruit.

At times so-called "sinking soils" are found. These soils settle badly and if orchards are planted before the land is irrigated and handled several years, the orchard will often be a failure, since the soil settles away from the body of the trees and leaves the roots exposed.

In choosing land, especially in the "Inland Empire," one should constantly be on their guard for the presence of alkali. At times the alkalinity becomes so high that it would be impossible to grow most of our fruits successfully. It is especially apt to be bad where seepage water comes to the surface. While it has generally been felt that lime stone has been very valuable in the production of fruit, nevertheless the orchardists of the "Inland Empire" seem to think the marl soils undesirable, the trees not seeming to do well on such soils. The question often comes up concerning the use of old land for orchard purposes. It is the general belief of our fruit growers that sage brush lands will grow fruits better if they are put into some other crop for a few years. When first cleared they are light in character, contain very little organic matter and humus, and trees have difficulty in getting a good start, but after a few crops of rye, oats, vetch, or other grain, and after being worked over a few times, they settle, become more compact and seem to be in a better condition for the growing of trees.

As to the advisability of planting trees on newly cleared timber land there is a difference of opinion. Many people have had poor success in putting trees out immediately after clearing. This is probably true of land which has been in heavy fir or other coniferous types, if there is very little organic matter present, but if the land has been worked over for a year or two with potatoes or some other field crop the trees take hold much better. However, undoubtedly the condition in which the land is found before the trees are planted and the season in which the trees are planted will make some difference as to results. Where the land is not put into very

good shape until late spring and the trees not planted until that season, good results are not to be expected. But if the land is put in good condition the preceding fall or winter and the trees planted in the spring, very good results are often secured.

Often the question is asked "What is the influence of light versus heavy soil on fruit growing?" In a general way the lighter loams tend to bring the trees into bearing earlier and it often tends to produce a very good color, but it is said by many that the fruit is not as large nor develops quite as good keeping qualities as fruit produced on the heavier loams. However, I do not believe one is justified in making quite such broad statements as it has already been shown that climatic conditions have a very strong effect on types of fruit which can be grown.

SUB-SOILS.

Before leaving the matter of soils we must take up the matter of sub-soils. In very many cases the sub-soil is of much more importance than the surface soil. If one should get *soil four or five feet deep* in which there is very little change in the soil to that depth it is desirable. At times one will find hard-pan clay close to the surface. This hard strata is sometimes the result of poor farm operations but at times the clay is so stiff that roots cannot work in it.

Gravel is a form of sub-soil which has to be watched for very carefully. Course gravel will not hold moisture well and where it is close to the surface it means the soil is subject to drying out. It is also difficult to irrigate such soils successfully. At times this gravel, instead of being loose, is cemented and so hard that it cannot be gotten through with a pick and shovel; such sub-stratas are not desirable. Rock is often found and where it is hard and not disintegrated and comes fairly close to the surface one cannot possibly hope to grow most of our fruits successfully. But where it is breaking down very easily and can be bored through with an auger, trees may do fairly well. These rocks may even be liberating mineral foods necessary for good tree growth.

The sandy loam sub-soils are very desirable. They generally mean good drainage and trees growing on such soils often do remarkably well. Only we must be careful not to get those which are nearly all sand or where the sand comes too near the surface. They will have a tendency to dry out if too much sand is present.

HINTS ON CHOOSING ORCHARDS WEST OF THE CASCADE RANGE.

In choosing an orchard in the valleys of the Cascade Mts. or in the regions to the westward there are a few points I want to emphasize.

First of all, one of the most important factors is the depth of soil, as in the greater part of this region irrigation is not practiced and neither will irrigation be necessary for the greater part of it, as with proper orchard management and with depth of soil splendid results can be obtained without irrigation. One will need to note the recommendations for frosts as to some types of trees on level lands at the base of hills where frosts, at times, are injurious, although the greater part of this region has good air drainage and the atmospheric conditions are such that frost damage as a rule is not serious.

The stronger clay loams of this region are especially adapted for pears and the lighter clay loams and free soils are splendid for apples while the red hill lands and the lighter types of hill lands are adapted especially for prunes and cherries. On some of the southern exposures grapes will grow well, especially the American varieties. In parts of southern Oregon, in Jackson and Josephine Counties, Vinefera, types like Muscat, Tokay and Malaga will succeed, especially where the hills have the warm, southern exposure, are not subject to frosts and where cold winds and fogs are not a problem. In this region too, peaches do well on the river bottoms especially and on some of the red shot hills. The sand and silt loams along the river bottoms of this region are noted for their fertility and wide adaptability.

POINTS TO OBSERVE IN CHOOSING AN ORCHARD IN THE “INLAND EMPIRE.”

Where irrigation is not practiced in this region great depth is to be desired. Where irrigation is practiced extreme depth is not so necessary although it is highly desirable. In many regions one should look into the possibility of frost. Frost damage will become less and less as time goes on and as irrigation increases it means proper moisture conditions which will make frost damage less severe. Seepage waters become troublesome at times, especially in irrigated districts. Good deep soils, which have a heavy growth of sage-brush will generally give good results. These are usually high-

ly productive, bring the trees into bearing early and make very desirable fruit locations.

SPECIAL CROP REQUIREMENTS.

THE APPLE.

In producing apples, especially winter apples, we have to bear in mind that we are growing trees which will become long-lived, drawing heavily on the soil for both food and moisture and successful apple culture means that we must fulfill its requirements. Prunes, peaches and cherries and similar fruits are not so exacting regarding moisture conditions and often are not so exacting regarding the soil, as is the apple. We are growing so many commercial varieties of apples that we must look very closely into the condition which each variety requires and this will mean close study of climatic conditions, elevations, exposures, and soil, all taken together, to make up the requirements of the individual variety.

The Spitzenberg, for example, seems to be the most popular apple of the Northwest, yet there are relatively few regions where this apple will do well. If planted at too high an altitude, say that above 1500 feet, it becomes a shy bearer, is very subject to winter injury and what fruit it does produce is often of poor color. It is a variety that is very tender and subject to all the afflictions a tree is heir to. If it is on a very light, dry soil it will *generally* bear fairly abundantly provided the altitude is not too high but the fruit will seldom be bright in color. If on the other hand it is grown on deep, rich moist loam, there is a tendency to run strongly to wood growth. Where one has a soil of good fertility, a fair moisture condition, a warm southern exposure and not too high an altitude, the Spitzenberg will do well.

The Gano will often flourish on locations where the Spitzenberg would be a failure, so much more money would be realized in planting the Gano, succeeding on lighter loams and higher altitudes than Spitzenberg.

If the growing season terminates abruptly we find that nearly all apples tend to be shy bearers. Winter injury is apt to result and what growth the tree does make is apt to be vegetative rather than fruit production.

The Northern Spy is an apple which requires very careful at-

tention. At high altitudes it is very shy in bearing well; on low altitudes it often grows soft and large and is a poor keeper and its quality under such conditions is very poor. On some of the lighter clay loams west of the Cascades the Northern Spy seems to do very well.

The Yellow Newtown seems to be especially adapted for such regions as the valleys of the Cascade Range and those to the west as the Hood River, the Willamette valley and the southern Oregon districts for example and while it does well in some of the inland valley regions of the "Inland Empire" in many of these regions it matures too early. It is not an apple which is adapted to high altitudes, there it becomes woody and dry and small and of generally poor quality. When the Yellow Newtowns are planted on very rich, heavy soils, especially if careful pruning is not practiced, they will run to wood and often will not bear for 12 or 15 years.

The Rome Beauty is becoming a very popular apple in the northwest and is showing itself to be adapted to an enormous range of territory. They do well in some of the "Inland Empire" valleys and also in western Oregon and Washington. Under proper conditions it tends to be a good bearer. Like the Spitzenberg it is tender under certain conditions, especially where there is an abrupt termination between the fall and winter weather. Where the growing season tends to be short it is not well to plant such varieties as the Yellow Newtown and the Winesap as neither one does well.

The Ben Davis is an apple of rather wide adaptability, but when planted at rather high altitudes, 2000 ft. and better, it often becomes very corky and dry.

The Wagener seems to be an apple of very wide range. If we could justly say there is a single variety having very little limitations in the northwest it would be the Wagener. It is found succeeding not only west of the Cascades but also in the region to the east of them. It does well on a wide variety of soils and under widely varying climatic conditions.

Where extreme drouth is experienced and winter hardship is extreme there is nothing which will do better than the Russian apples, the Duchess, Wolf River and Wealthy being included in this class. The York Imperial and McIntosh Red also succeed well under such conditions the McIntosh Red being of very fine quality if properly grown. The King of Tompkins County, Rome Beauty and Hyde King also flourish under such conditions. The

Gravenstein should also be tried more extensively on high altitudes of limited rainfall. The Red Cheek Pippin should be planted more west of the Cascades than it is at the present time. It does not bring the highest prices but does well on our clay loams, tends to bear annually and is well known in a certain trade.

Apples like the Winter Banana and Delicious do not do very well on the low altitudes; they tend to mature too early and become very mealy and poor keepers. On some of the higher altitudes they have a better texture and form, have a more attractive color and are better keepers.

In some of the valleys such as are found in the "Inland Empire," it is hard to beat the Winesap, Jonathan and Rome Beauty, while in some cases the Spitzenberg does very nicely. The Arkansas Black does very well here sometimes. Occasionally the Spitzenberg matures too early and apples like the McIntosh Red become late summer or fall apples instead of winter apples.

Where the seasons are especially short, summer and fall varieties should be planted and all winter varieties abandoned.

PEARS.

The Pacific Northwest should be the leading pear region of the United States.

The Rogue River Valley in southern Oregon is especially world noted as producing pears of wonderful quality and fine shipping character.

Pears, while perhaps not succeeding on as high altitudes as apples, will nevertheless, within their range, stand more hardship than apples. They will stand more alkali than most other fruits. As far as soil is concerned, they have a wide range being grown on the heaviest soil on the one hand to the lightest loams on the other. The best regions to grow pears is where there is a long growing season of not too warm weather, where the winter conditions do not come on too abruptly and where the rainfall and moisture is such that a slow gradual growth of tree can be produced. Pears are more adapted to the regions west than to those east of the Cascade Mts. and to those regions having at least 20 inches rainfall than to other localities.

The Bartlett is a pear of wide adaptability and can be grown on the heaviest to the lightest of soils. This is also true of the Comice and Howell. The d'Anjou and Bosc seem to do especially well on

the heavier soils while the Winter Nelis should only be planted on deep, rich loams, as this variety, unless it has plenty of moisture and food becomes small. The Comice should not be grown where it tends to russet very much. It does well in southern Oregon. The Bosc, Winter Nelis and Glou Morceau do well in climatic conditions like those of the Willamette Valley, while the Rogue River Valley is growing a wide range of varieties, the Bartlett, d'Anjou and Winter Nelis, Comice, Bosc and Howell are all succeeding.

Of all pears grown the Bartlett is found growing over the widest range, but undoubtedly more varieties of pears should be tried than we have grown up to the present time.

CHERRIES.

Cherries do best on well drained, light loams. The soil, however, should not be so light and warm as to cause premature growth in the spring. Where they are planted on heavy clay loams they seem to run to wood very largely and are also more subject to certain diseases than when planted on better drained, warmer loams. The sweet cherry especially will not stand much winter freezing and regions of high altitude and extreme freezing should be planted to sour cherries and the Duke types.

The Vilna Sweet will stand considerable hardship while the Bing does especially well in eastern Oregon. Often it thrives as high as 3000 ft. east of the Cascades, while in our valleys the Royal Ann and the Lambert are the two great leaders. Some of the inland valleys are also producing cherries very successfully, the greatest trouble at times being winter injury.

In the valleys west of the Cascades the cherry is often found to be very extensive. Here they grow to enormous size, luscious and juicy. Enormous canning industries will be developed while many of them are shipped green. The Pacific northwest can produce sweet cherries unexcelled. Unfortunately the Royal Ann, a large, fancy flesh colored cherry, does not stand rain well while ripening and under such conditions cracks badly. If conditions could be found where this cherry could mature and not be subject to such cracking and yet keep its size and other characteristics it would be very valuable to the state.

PEACHES.

Peaches as a rule like a warm soil. We have them growing

well in such valleys as the Wenatchee, North Yakima and the valleys along the Snake and in southern Oregon in the regions adjacent to Ashland and Merlin, while in the Willamette Valley they succeed on the sandy river bottoms on the one hand and on the red shot hill lands on the other. Peaches are very susceptible to frost and the trees will not stand very much dry freezing. When planted on the heavy loams they make good vegetative growth but as a rule are not fruitful.

APRICOTS.

The apricot is closely associated with the peach and in many respects is a hardier tree but blooms so early it is caught by the frost. In such regions as The Dalles and some places in southern Oregon and *regions along the Columbia and the Snake, locations can be found which are frost proof.* This fruit brings splendid returns and more should be grown. There is a very strong demand for apricots for canning purposes.

ALMONDS.

Almonds are closely related with both the peach and the apricot. It is a fairly hardy tree and will stand better drouth conditions than either the peach or apricot provided the soil is deep. It is a deep rooted tree and does well where the soil is deep. The one great drawback with it is its early blooming and consequent loss from frost injury. Where regions can be found *not subject to frost* almond growing becomes very profitable.

PRUNES.

Most of the prunes are grown west of the Cascade Range. They grow on sandy river loams to red hill lands and seem to do well on all soils except those which are heavy and poorly drained. On the lighter loams they are generally put on peach roots while on some of the heavier soils they are propagated on plum roots. In the region west of the Cascades they are grown almost entirely for *evaporating purposes* except those years when the eastern crops of prunes and peaches are very light when many are shipped green. *The prune shows signs of becoming one of the greatest industries on the Pacific coast.* As prunes bloom early they suffer consequently at times from frost and also from long, cold rainy spells in the spring which are not favorable to their blossom development.

In the "Inland Empire" and in many valleys of the Columbia and the Snake prunes are grown for *shipping green* and under proper conditions become a very profitable crop.

The principal prune grown is the Italian; where not over-irrigated they produce a good firm shipping product of good quality.

GRAPES.

There are only limited regions in which grapes can be grown successfully. The American grapes like the Concord, Niagara, Delaware, Brighton and Worden are hardy for most parts of the northwest and do exceedingly well where they are protected from cold winds. They prefer the sunny exposures on our hillsides, although some of the sandy river bottoms produce very good grapes.

The European varieties, the Vinifera or California grapes succeed *along the Columbia and Snake*. At The Dalles for example, they are found growing well. In many regions of the "Inland Empire" with winter protection they have grown successfully. In parts of southern Oregon they are doing especially well without winter protection.

In conclusion I wish to encourage our fruit growers as much as possible to make some careful studies concerning variety adaptability. If possible, get a maximum and minimum thermometer and keep records of the length of your growing season and of your rainfall.

Prof. C. I. Lewis, of the Division of Horticulture of the Oregon Agricultural College would appreciate very much to see any such data as the fruit growers could send him and it will assist us very materially in securing data which is so hard to obtain.

In determining whether or not a variety succeeds in your region do not base your opinion on the very best specimens you can find because the amount of money you will make out of any good variety is going to depend on the *average fruit* the tree produces and not upon what a few fine specimens will bring. If the average fruit of a variety comes up to good market requirements you can justly draw the conclusion that the variety will succeed.

